

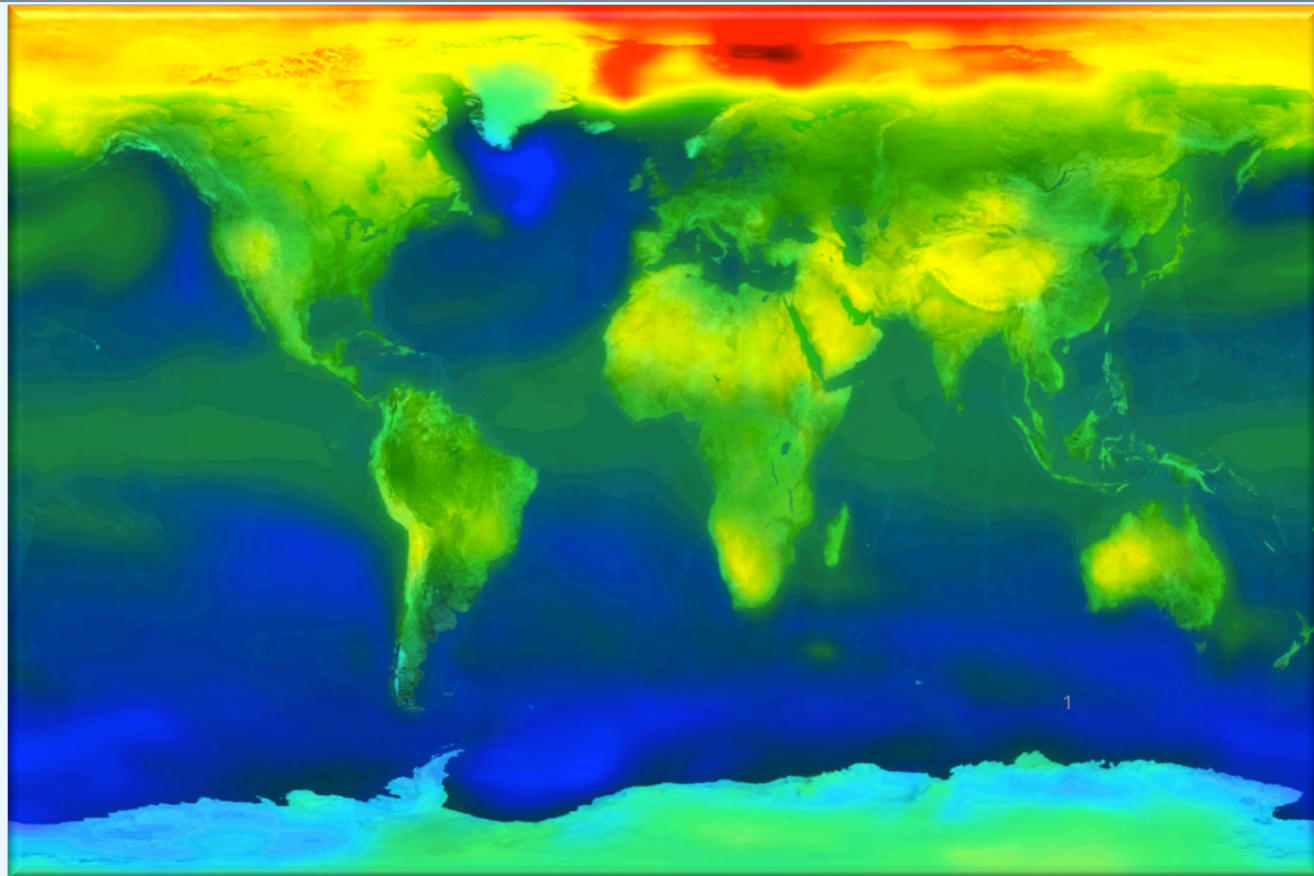
# Ultra-scales Visualization Climate Data Analysis Tools (UV-CDAT): Earth System Modeling: Advanced Scientific Visualization of Ultra-Large Climate Data Sets

Dean N. Williams on behalf of the UV-CDAT Project

Analysis and Visualization Framework

Scientific Analysis and Visualization Infrastructure and Framework Presentation ♦ June 27, 2012

## DOE BER Climate Visualization Collaborators



# Outline

## Overview

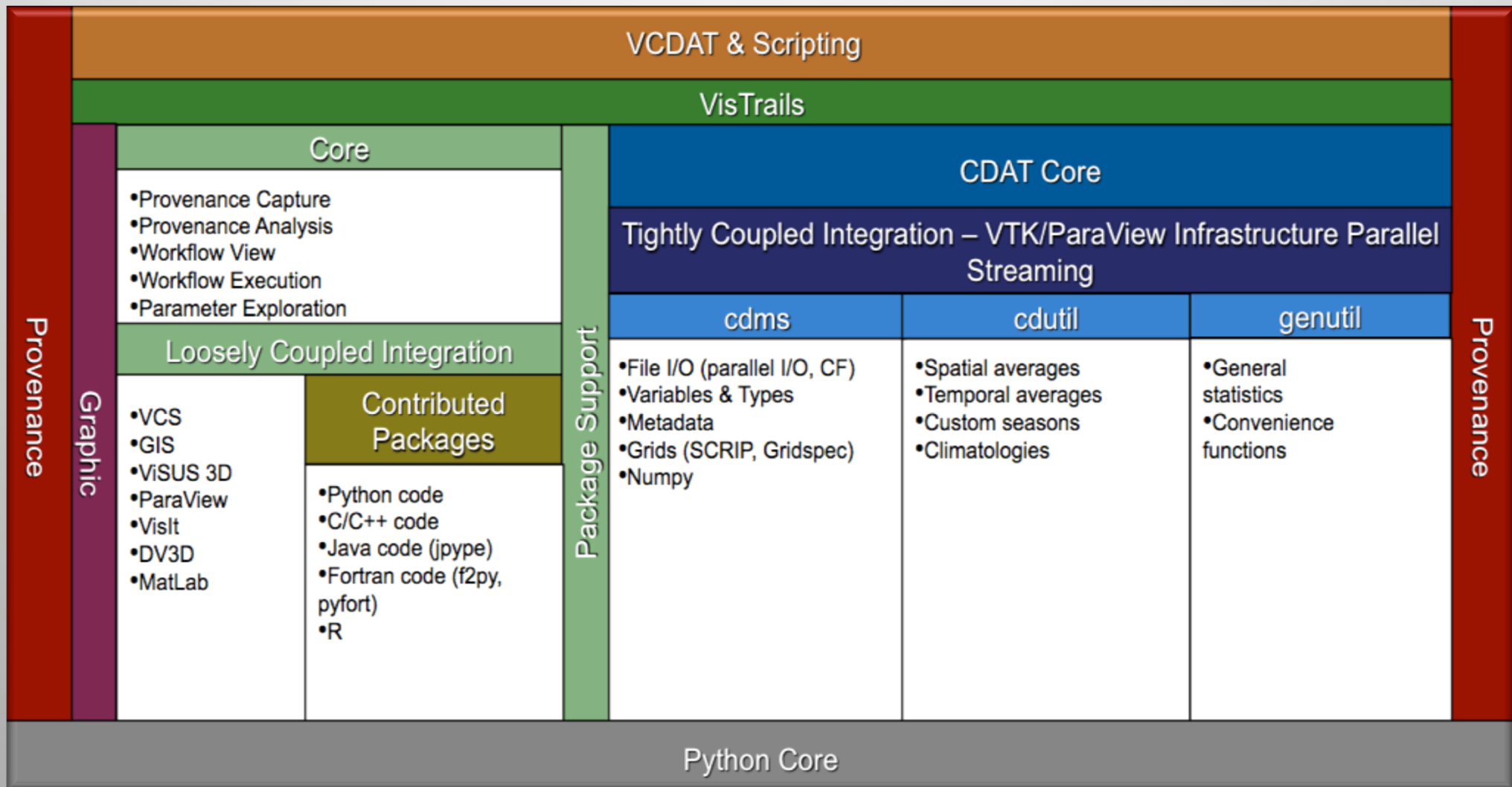
- Architecture
- Complexity
- Level of software builds and integration
- Functionalities
- Use Cases



## Interaction

- YouTube Video Tutorials ...
- Live UV-CDAT Demonstration ...
- Q & A

# Ultra-scale Visualization Climate Data Analysis Tools (UV-CDAT) Architectural Layers

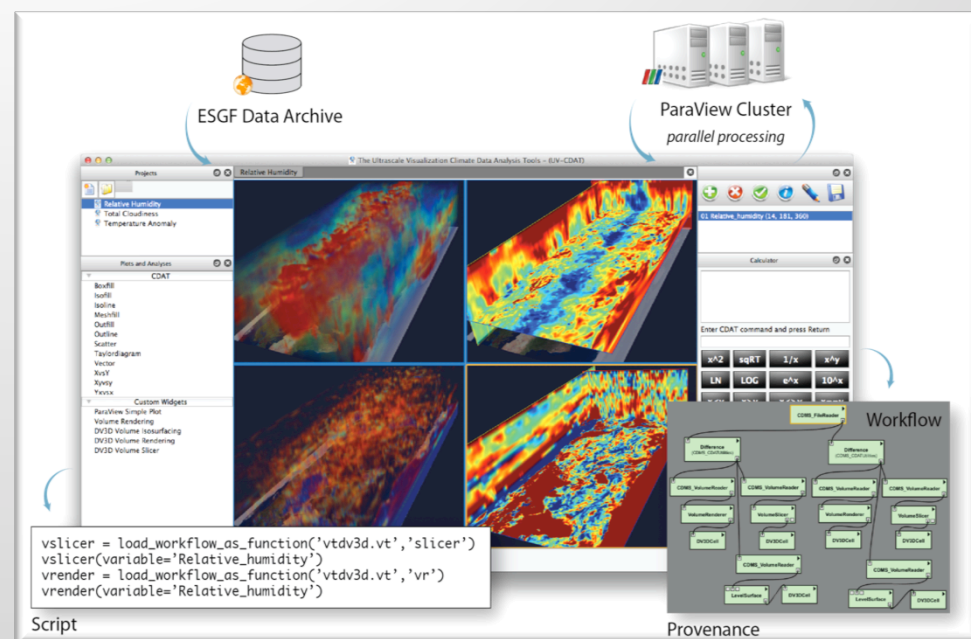


# Ultra-large Climate Data Analysis and Visualization (UV-CDAT)

## Approach

Integrates several existing, widely used open-source data analysis and visualization packages into seamless environment

- CDAT – Climate data analysis/viz
  - VTK - Visualization Toolkit
  - R – Statistical analysis
  - VisTrails – Workflow Provenance
  - Visit, ParaView, DV3D – 3D Visualization
- Local and remote visualization and data access
  - Comparative visualization and statistical analyses
  - Robust tools for regridding, reprojection, and aggregation
  - Support for unstructured grids and non-gridded observational data, including geospatial formats often used for observational data sets
  - Workflow analysis and provenance management



Joint climate data vision for large-scale visualization and analysis.

## Highlights

- Official Release of UV-CDAT version 1.0.1
- Website documentation and Video Tutorials
- Ultra-scale Reusable Analysis and Diagnostics Framework (U-ReAD)
- Ensemble Data analysis Environment (EDEN)
- LibCF Mosaic Grids and ESMF Regridding
- Climate Science R&D

# Integrated UV-CDAT: Displaying CDAT, DV3D, ParaView, VisIt, and R

<http://uvcdat.llnl.gov>

The screenshot displays the VisIt software interface with several panels and plots:

- Projects Panel:** Shows a project named 'Project 1\*' with a 'Sheet 1' containing several 'untitled\*' files.
- Plots and Analyses Panel:** Lists available plot types including DV3D, PVClimate, PV Climate Plot, VCS, VisIt, Contour Plot, Extreme Value Analysis Plot, and Pseudocolor Plot.
- Variables Panel:** Lists variables such as 'pr (7300, 64, 128)', 'v (2, 80, 97)', 'u (2, 80, 97)', 'clt (120, 46, 72)', 'ta (11, 17, 73, 144)', 'precip (217, 288)', 'temp (217, 288)', and 'TEMP (42, 2400, 3600)'. It also includes a 'Calculator' section with a complex expression for 'pvvariablename'.
- Plot 1 (Top Row):**
  - Panel A:** A 2D contour plot of precipitation (pr) over a geographic region, labeled 'Visit'.
  - Panel B:** A 2D contour plot of temperature (temp) over a geographic region, labeled 'CDAT'.
  - Panel C:** A 3D visualization of a data volume, labeled 'DV3D'.
- Plot 2 (Bottom Row):**
  - Panel A:** A 3D visualization of a data volume, labeled 'ParaView'.
  - Panel B:** A 2D contour plot of precipitation (pr) over a geographic region, labeled 'CDAT'.
  - Panel C:** A 2D contour plot of precipitation (pr) over a geographic region, labeled 'R'.

# Live UV-CDAT Demonstration



Ultrascale Visualization - Climate Data Analysis Tools

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Kitware



ParaView



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**ENERGY**

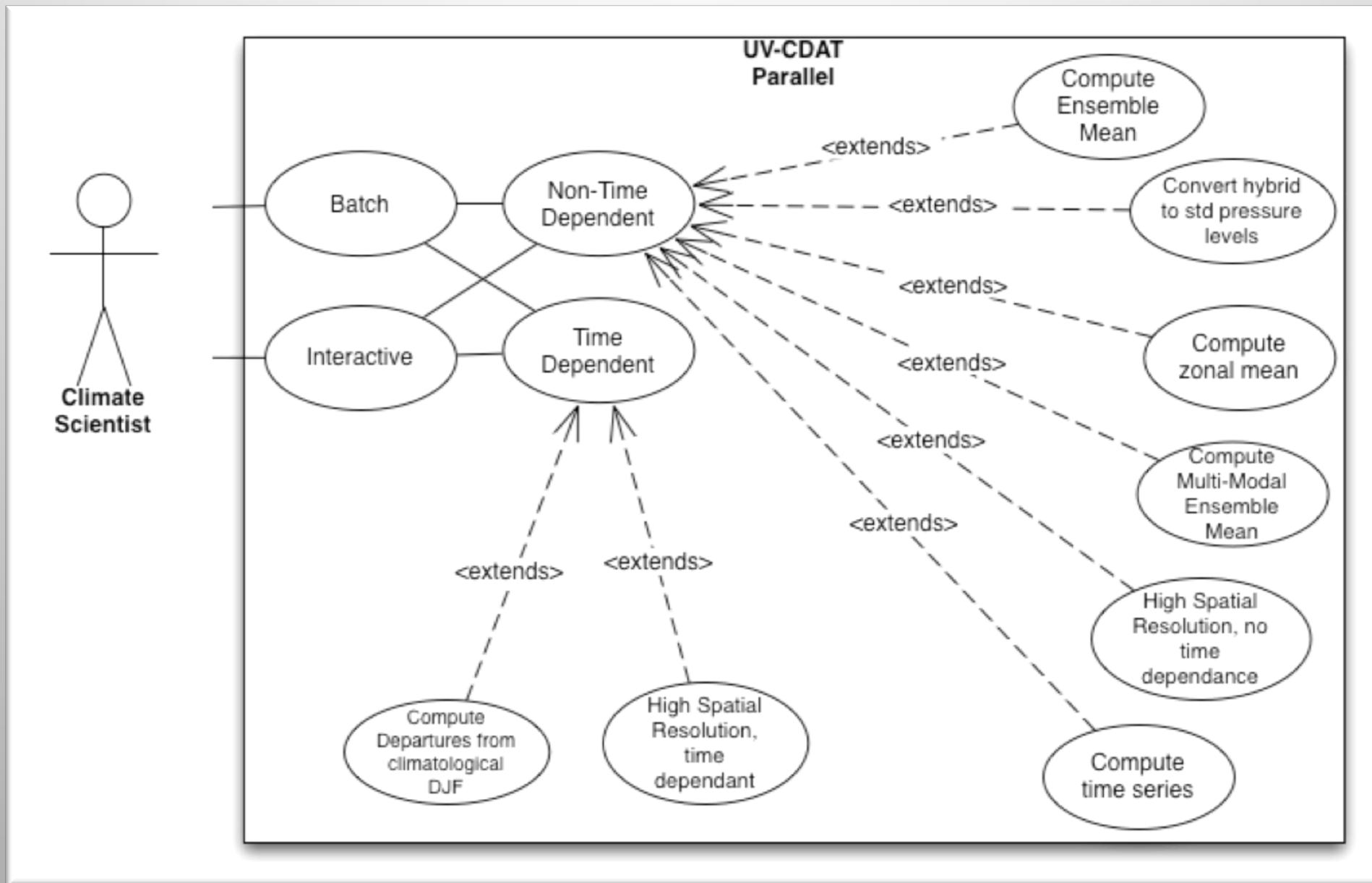
Office of  
Science

Williams' CESD UV-CDAT  
Presentation 2012



# BACKUP SLIDES

# Use Cases for UV-CDAT





# Official Release 1.0.1 Build and Installation

- UV-CDAT Installation
  - **Binaries** (Ubuntu, Fedora, Mac)
  - **Manual** (Linux, Mac)
  - **URL** (<http://uvcdat.llnl.gov/install>)

